

# ADULT & NON-EMBRYONIC STEM CELL RESEARCH

## Advances & Updates for June 2006

### HIGHLIGHT OF THE MONTH –

#### Stem Cell Hope for Neurodegenerative Diseases

The results of a study published in the April issue of *Stem Cells and Development* suggest that human stem cells derived from bone marrow are predisposed to develop into a variety of nerve cell types, supporting the promise of developing [adult] stem cell-based therapies to treat neurodegenerative disorders such as Parkinson's disease and multiple sclerosis. These surprising results lend a new perspective to [adult] stem cell differentiation and suggest that multipotential stem cells may express a wide variety of genes at low levels and that stem cells achieve their remarkable plasticity by downregulating the expression of many of these background genes.— *Genetic Engineering News*, May 1, 2006

### ADVANCES IN HUMAN TREATMENTS USING ADULT STEM CELLS—

**HEART:** Patients' Own Adult Stem Cells May Lead to Better Treatment of Heart Damage — “A team of US researchers has discovered the ‘home’ of stem cells in the heart, lending credence to the idea that the heart has the capacity to repair itself. The results are promising...and may eventually give better heart-healing results than bone-marrow derived stem cells.” — *New Scientist*, May 29, 2006

**INCONTINENCE:** Doctors Call Adult Stem Cells ‘cure’ for Incontinence— “The finding...is the latest accomplishment in a promising area of research: using adult stem cells derived from patients’ own muscle tissue to treat a troubling condition that affects more than 15 million Americans. The researchers described the treatment as a cure, meaning the patients did not need to wear absorbent pads after they were treated.”— *Milwaukee Journal-Sentinel*, May 21, 2006

**GENETIC METABOLIC DISEASE:** Cord Blood Transplantation Study Documents Help for Children with Genetic Metabolic Diseases—The published results of a long-term study of treatment with cord blood adult stem cells shows excellent survival of infants and young children that would normally die of neurological and other organ damage due to genetic metabolic diseases such as adrenoleukodystrophy (Lorenzo’s Oil disease), Krabbe disease, and Hurler syndrome, and other lysosomal and peroxisomal storage diseases (where toxic compounds accumulate due to an inherited enzyme defect).—Martin *et al.*, *Biology of Blood and Marrow Transplantation* 12, 184-194, 2006

**NERVE REGENERATION:** Previously Unknown Molecule Called Oncomodulin Spurs Regeneration in Optic Nerve — Researchers have discovered a naturally occurring growth factor that stimulates regeneration of injured nerve fibers (axons) in the central nervous system. “Under normal conditions, most axons in the mature central nervous system (which consists of the brain, spinal cord and eye) cannot regrow after injury...Benowitz, the study’s senior investigator, believes oncomodulin could someday prove useful in reversing optic-nerve damage caused by glaucoma, tumors or traumatic injury. In addition, the lab has shown that oncomodulin works on at least one other type of nerve cell, and now plans to test whether it also works on the types of brain cells that would be relevant to treating conditions like stroke and spinal cord injury.”— *AScribe Newswire*, May 14, 2006

**RESPIRATORY CONDITIONS:** Adult Stem Cells Differentiated into Lung Cell; Could Be Used to Treat Emphysema and Pulmonary Fibrosis. — “Researchers at the University of Minnesota ... differentiated [a cord blood adult stem cell] into lung cells responsible for making surfactant, a substance enabling respiration. ... this is the first time human stem cells—from any source—have differentiated into type II alveolar cells, the type of epithelial cells that help stabilize the lung's air sacs during breathing. ... ‘Turning a cord blood stem cell into an alveolar cell represents a significant milestone in stem cell research,’ said David McKenna, M.D., assistant professor of Lab Medicine and Pathology and assistant medical director of the Clinical Cell Therapy Lab at the University of Minnesota. ‘[This milestone] could be used to help develop a human lung model for research purposes and/or eventual therapeutic application to treat a number of respiratory conditions -- such as emphysema and pulmonary fibrosis, as well as pulmonary injury due to therapy-related causes.’” — *Pharmalife.com Businesswire*, May 8, 2006

## **70 CURRENT HUMAN CLINICAL APPLICATIONS USING ADULT STEM CELLS\***

### **ANEMIAS & OTHER BLOOD CONDITIONS:**

- Sickle cell anemia
- Sideroblastic anemia
- Aplastic anemia
- Red cell aplasia (failure of red blood cell development)
- Amegakaryocytic thrombocytopenia
- Thalassemia (genetic [inherited] disorders all of which involve underproduction of hemoglobin)
- Primary amyloidosis (A disorder of plasma cells)
- Diamond blackfan anemia
- Fanconi's anemia
- Chronic Epstein-Barr infection (similar to Mono)

### **AUTO-IMMUNE DISEASES:**

- Systemic lupus (auto-immune condition that can affect skin, heart, lungs, kidneys, joints, and nervous system)
- Sjogren's syndrome (autoimmune disease w/ symptoms similar to arthritis)
- Myasthenia (An autoimmune neuromuscular disorder)
- Autoimmune cytopenia
- Scleromyxedema (skin condition)
- Scleroderma (skin disorder)
- Crohn's disease (chronic inflammatory disease of the intestines)
- Behcet's disease
- Rheumatoid arthritis
- Juvenile arthritis
- Multiple sclerosis
- Polychondritis (chronic disorder of the cartilage)
- Systemic vasculitis (inflammation of the blood vessels)
- Alopecia universalis
- Buerger's disease (limb vessel constriction, inflammation)

### **BLADDER DISEASE:**

- End-stage bladder disease ‡

### **CANCERS:**

- Brain tumors—medulloblastoma and glioma
- Retinoblastoma (cancer)
- Ovarian cancer
- Skin cancer: Merkel cell carcinoma
- Testicular cancer
- Lymphoma
- Non-Hodgkin's lymphoma
- Hodgkin's lymphoma
- Acute lymphoblastic leukemia
- Acute myelogenous leukemia
- Chronic myelogenous leukemia
- Juvenile myelomonocytic leukemia

- Cancer of the lymph nodes: Angioimmunoblastic lymphadenopathy
- Multiple myeloma (cancer affecting white blood cells of the immune system)
- Myelodysplasia (bone marrow disorder)
- Breast cancer
- Neuroblastoma (childhood cancer of the nervous system)
- Renal cell carcinoma (cancer of the kidney)
- Soft tissue sarcoma (malignant tumor that begins in the muscle, fat, fibrous tissue, blood vessels)
- Various solid tumors
- Waldenstrom's macroglobulinemia (type of lymphoma)
- Hemophagocytic lymphohistiocytosis
- POEMS syndrome (osteosclerotic myeloma)
- Myelofibrosis

### **CARDIOVASCULAR:**

- Acute Heart damage
- Chronic coronary artery disease

### **IMMUNODEFICIENCIES:**

- Severe combined immunodeficiency syndrome
- X-linked lymphoproliferative syndrome
- X-linked hyper immunoglobulin M syndrome

### **LIVER DISEASE:**

- Chronic liver failure

### **NEURAL DEGENERATIVE DISEASES & INJURIES:**

- Parkinson's disease
- Spinal cord injury
- Stroke damage

### **OCULAR:**

- Corneal regeneration

### **WOUNDS & INJURIES:**

- Limb gangrene
- Surface wound healing
- Jawbone replacement
- Skull bone repair

### **OTHER METABOLIC DISORDERS:**

- Sandhoff disease (hereditary genetic disorder)
- Hurler's syndrome (hereditary genetic disorder)
- Osteogenesis imperfecta (bone/cartilage disorder)
- Krabbe Leukodystrophy (hereditary genetic disorder)
- Osteopetrosis (genetic bone disorder)
- Cerebral X-linked adrenoleukodystrophy

‡ New to the List This Month

\* **There are no current clinical trials in humans with embryonic stem cells:**

*"It is nearly certain that the [human] clinical benefits of the [embryonic stem cell] research are years or decades away. This is a message that desperate families and patients will not want to hear."*

— Science, June 17, 2005